DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 12-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ojha et al. (Impact of Noise and Target Fluctuation on the Performance of Frank Polyphase Coded Radar Signals) in view of Widdowson et al. (US Patent 7,372,891) and further in view of Ohmi et al. (US Patent 7,330,496 B2).

(1) Regarding claim 12, Ojha et al. discloses a CDMA transmission apparatus comprising:

a spreading code generator that generates a b^{th} chip C(a,b) of an a^{th} spreading code by a following equation,

$$C(a,b) = e^{j(2n\pi/N)}$$

where e is a base of natural logarithm, N is a length of the spreading code, n=axb, a=0~N-1, and b=0~N-1 (pg. 616, II. Frank Coded Waveforms). Ojha et al. does not explictly teach that the polyphase codes are spreading codes.

However, Widdowson et al. teaches that polyphase codes are spreading codes (col. 1, lines 57-67).

Thus it would have been obvious to one of ordinary skill in the art at the time of invention to use the polyphase codes as spreading codes as taught by Widdowson et al. because

polyphase codes offer good correlation properties. A spreading code generator would be inherent.

Neither Ojha et al. nor Widdowson et al. teach a spreader that spreads a transmission signal using the spreading code generated in the spreading code generator, wherein: an inverse discrete Fourier transformer is used to constitute the spreading code generator and the spreader.

However, Ohmi et al. discloses in Fig. 1, an inverse discrete Fourier transform (IFFT, 15; It is well-known in the art that all IFFT functions may be replaced by an inverse discrete Fourier transform) is used to constitute a spreading code generator and the spreader (col. 6, lines 7-20).

It would have been obvious to one of ordinary skill in the art at the time of invention to incorporate the teachings of Omni et al. to provide a spread spectrum communication system and method that are superior to conventional ones in transmission characteristics and multiplexing capacity.

(2) Regarding claim 13, Ojha et al. discloses a CDMA transmission apparatus comprising:

a spreading code generator that generates a b^{th} chip C(a,b) of an a^{th} spreading code by a following equation,

$$C(a,b) = e^{j(2n\pi/N)}$$

where e is a base of natural logarithm, N is a length of the spreading code, n=axb, a=0~N-1, and b=0~N-1 (pg. 616, II. Frank Coded Waveforms). Ojha et al. does not explictly teach that the polyphase codes are spreading codes.

However, Widdowson et al. teaches that polyphase codes are spreading codes (col. 1, lines 57-67).

Thus it would have been obvious to one of ordinary skill in the art at the time of invention to use the polyphase codes as spreading codes as taught by Widdowson et al. because polyphase codes offer good correlation properties. A spreading code generator would be inherent.

Neither Ojha et al. nor Widdowson et al. teach a spreader that spreads a transmission signal using the spreading code generated in the spreading code generator, wherein: a plurality of inverse discrete Fourier transformers are used to constitute the spreading code generator and the spreader and performs inverse discrete Fourier transform on the transmission signal hierarchically.

However, Ohmi et al. discloses in Fig. 2, wherein a plurality of cascaded inverse discrete Fourier transformers (IFFT, 15; It is well-known in the art that all IFFT functions may be replaced by an inverse discrete Fourier transform) are used to constitute a spreading code generator and the spreader and perform inverse discrete Fourier transform on the transmission signal hierarchically (Fig. 3, col. 6, lines 40-55; Ohmi et al. discloses an inverse Fourier transform applied in order of V_{d1}, V_{d2}..... V_{d16}; an inverse Fourier transform applied on V_{d1} and then V_{d2} through V_{d16} would constitute a plurality of cascaded transformers performing on the signal hierarchically).

It would have been obvious to one of ordinary skill in the art at the time of invention to incorporate the teachings of Omni et al. to provide a spread spectrum communication system and method that are superior to conventional ones in transmission characteristics and multiplexing capacity.

(3) Regarding claim 14, claim 14 discloses a reception apparatus for the spreading code of claim 12. As noted above, the combination of Ojha et al. and Widdowson et al. disclose the spreading generator for the transmitter. It is well-known in the art the receiving apparatus for spreading codes would have a spreading code generator that generates an inverse spreading code (creating respective complex conjugates) to undo the spreading code applied at the transmitter to obtain the transmitted data. Therefore it would be obvious to one of ordinary skill in the art at time of invention to incorporate a spreading code generator that generates a spreading code by the equation;

$C^*(a,b) = e^{-j(2n\pi/N)}$ (to create respective complex conjugates) to obtain the transmitted data spread by spreading code $C(a,b) = e^{j(2n\pi/N)}$.

Furthermore, Widdowson et al. teaches in Fig. 11, a despreader that despreads a received signal using a spreading code generated in the spreading code generator.

Neither Ojha et al. nor Widdowson et al. disclose wherein a discrete Fourier transformer is used to constitute the spreading code generator and the despreader.

However, Ohmi et al. discloses in Fig. 1, a discrete Fourier transform (15) is used to constitute a spreading code generator and the spreader (col. 6, lines 16-20; Ohmi et al. discloses elements of found vectors replace by their respective conjugate complex numbers, thereby obtaining inverse spreading codes to be used by the receiving apparatus, inherently implying an DFT/FFT (inverse of IDFT/IFFT) to create inverse spreading codes.

It would have been obvious to one of ordinary skill in the art at the time of invention to incorporate the teachings of Omni et al. to provide a spread spectrum communication system and

method that are superior to conventional ones in transmission characteristics and multiplexing capacity.

(4) Regarding claim 15, claim 15 discloses a reception apparatus for the spreading code of claim 12. As noted above, the combination of Ojha et al. and Widdowson et al. disclose the spreading generator for the transmitter. It is well-known in the art the receiving apparatus for spreading codes would have a spreading code generator that generates an inverse spreading code (creating respective complex conjugates) to undo the spreading code applied at the transmitter to obtain the transmitted data. Therefore it would be obvious to one of ordinary skill in the art at time of invention to incorporate a spreading code generator that generates a spreading code by the equation;

$C^*(a,b) = e^{-j(2n\pi/N)}$ (to create respective complex conjugates) to obtain the transmitted data spread by spreading code $C(a,b) = e^{j(2n\pi/N)}$.

Furthermore, Widdowson et al. teaches in Fig. 11, a despreader that despreads a received signal using the spreading code generated in the spreading code generator,

However, Neither Ojha et al. nor Widdowson et al. disclose wherein: a plurality of inverse discrete Fourier transformers are used to constitute the spreading code generator and the spreader and performs inverse discrete Fourier transform on the transmission signal hierarchically.

However, Ohmi et al. discloses in Fig. 2, wherein a plurality of cascaded inverse discrete Fourier transformers (IFFT, 15; It is well-known in the art that all IFFT functions may be replaced by an inverse discrete Fourier transform) are used to constitute a spreading code generator and the spreader and perform inverse discrete Fourier transform on the transmission

signal hierarchically (col. 6, lines 16-20; Ohmi et al. discloses elements of found vectors replace by their respective conjugate complex numbers, thereby obtaining inverse spreading codes to be used by the receiving apparatus, inherently implying an DFT/FFT (inverse of IDFT/IFFT) to create inverse spreading codes. Fig. 3, col. 6, lines 40-55; Ohmi et al. discloses an inverse Fourier transform applied in order of V_{d1}, V_{d2}..... V_{d16} ; an inverse Fourier transform applied on V_{d1} and then V_{d2} and then through Vd_{16} would constitute a plurality of cascaded discrete transformers to apply a discrete Fourier transform on the signal hierarchically).

It would have been obvious to one of ordinary skill in the art at the time of invention to incorporate the teachings of Omni et al. to provide a spread spectrum communication system and method that are superior to conventional ones in transmission characteristics and multiplexing capacity.

Conclusion

3. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a.) Ojha et al. discloses Impact of Noise and Target Fluctuation on the Performance of Frank Polyphase Coded Radar Signals in 24th symposium on Communications.

b.) Katakura et al. discloses Asynchronous SSMA System Using Secret Polyphase Orthogonal Sequences With Elimination Filter For Co-channel Interference in IEEE International Conference on Systems Engineering.

c.) Suehiro et al. discloses Binary or Quadrature Signal Design For Approximately Synchronized CDMA Systems Without Detection Sidelobe Nor Co-channel Interference in

d.) Papadimitriou et al. discloses in US 2005/0031018 A1 IDFT matrix with elements $C[\alpha,\beta] \equiv W_N^{\alpha,\beta} \equiv e^{i2\pi\alpha\beta/N}, \alpha,\beta = 0,1,....N-1$ and that spreading sequences are provided by $e^{i2\pi\alpha\beta/N}$.

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lawrence B Williams whose telephone number is 571-272-3037. The examiner can normally be reached on Monday-Friday (8:00-6:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ghayour Mohammad can be reached on 571-272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Tesfaldet Bocure/
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